COTTAGE POLLUTION CONTROL PROGRAM

District Municipality of Muskoka

Honey Harbour
Severn River
Indian River

Simcoe County

Severn River

1978

Ministry of the Environment
Ontario

COTTAGE POLLUTION CONTROL PROGRAM

1978

DISTRICT MUNICIPALITY OF MUSKOKA

Honey Harbour - Township of Georgian Bay
Severn River - Town of Gravenhurst
Indian River - Township of Muskoka Lakes

SIMCOE COUNTY

Severn River - Townships of Orillia & Rama

REPORT PREPARED BY STAFF
IN THE CENTRAL REGION
MUSKOKA-HALIBURTON DISTRICT OFFICE
GRAVENHURST

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PREFACE

Ontario's thousands of beautiful inland lakes provide an abundant resource for recreational enjoyment. To protect the quality of these waters, a delicate environmental balance must be maintained.

A heavy influx of people may subject a lake and its surrounding environment to great stress. Uncontrolled development and imprudent use of our recreational lakes may cause their deterioration and destroy their natural qualities.

The Ontario Ministry of the Environment is attempting to bring some of these stress factors under control by a variety of programs. One of these, the Cottage Pollution Control Program, was initiated in 1970 to study the cottage waste disposal problem, to evaluate existing waste disposal systems and to enforce repairs to those found to be unsatisfactory.

The Ministry is carrying on research to improve the knowledge of private sewage systems and the movement of sewage effluent in shallow soils.

SUMMARY

The Cottage Pollution Control Program was established to detect and have corrected faulty private sewage disposal systems of cottages located on recreational lakes. The objective of the program is to investigate and, in conjunction with the owner, to undertake abatement work on those systems found to be faulty.

In 1978, 1,376 private sewage disposal systems were inspected in Honey Harbour (Georgian Bay), the Severn River (Muskoka and Simcoe County) and the Indian River (Lake Rosseau) in Muskoka. The inspection of these systems indicated that 35% were performing satisfacorily , 28% were seriously substandard, 23% were discharging wash water or solid waste onto the ground surface, 2% were direct polluters and 12% were unclassified after the initial detection survey. See Appendix I for the summary of inspection results.

As of December 31st, 1978, 73 agreements for corrective work to be carried out had been signed by the owners. Corrections have been completed and inspected for 124 systems; 392 letters have been sent to owners advising them that their systems are undersized and should be upgraded in the near future.

Contacts with owners are continuing during the winter to arrange for corrective action to be carried out in the spring of 1979.

COTTAGE POLLUTION CONTROL SURVEY

PREPARATION

During the winter of 1977, a reconnaissance and mapping program was undertaken by snowmobile on the lakes.

The snowmobile crews counted the number of establishments on each lake. Every one hundredth establishment on the shoreline was photographed and described. The cottages and non cottage properties such as marinas, camp grounds and lodges were then plotted on maps.

Data obtained from the snowmobile work, as well as that from Cottager Associations and other agencies, was used to prepare a work schedule for the student crews in the summer.

The co-operation of Cottager Associations contributed greatly to the success of the program. Prior to the commencement of the survey of each lake, a meeting is usually held with the Association. Members are given a brief outline of the survey procedures to be followed and also the information that would be required from each cottager. In certain cases, a mid-summer meeting is arranged with the Association during which abatement procedures are discussed.

In the event that a Cottage Association does not exist, notices are posted throughout the area, where people may congregate (local stores, post offices, public docks, etc.) This situation usually exists along rivers or small lakes.

Detection Surveys

The crews, each composed of two students, began the survey of the lake by preparing a description log. Each establishment was systematically numbered and accurately described to facilitate the location of the premises by other staff.

Each establishment was then inspected to determine the type, size, location and design of sewage disposal systems; the soil type and depth in the area of all tile beds; the source of drinking water; and other related factors.

A preliminary performance classification of all waste disposal systems was made by the students prior to referring the file to their supervisor for final classification.

Classification of Sewage Disposal Systems

The sewage disposal systems of all premises surveyed were classified into one of the following groups.

1. Satisfactory - the system meets all current standards of good design, construction and location, and is properly maintained.

2. Satisfactory (Acceptable) Performance - the system may not quite meet current standards of design and construction but is properly located with respect to distance from lake, well etc., and is maintained in good condition.

3. Seriously Substandard - a system which does not meet current standards of design, construction and location and/or is in a state of neglect. Although this system is not deemed to be causing pollution at the time of inspection, a potential hazard exists. The owner is notified of the deficiency and is advised that consideration should be given to updating the system in the near future.

4. Nuisance (Wash Water) - a system causing wash water to be exposed on the surface of the ground either directly through a waste pipe or escaping from a seepage pit. Such a condition is known as a Public Health Nuisance. Wash water discharged from any sanitary fixture is contaminated and creates an unhealthy environment. Phosphates and other nutrients from waste water discharges encourage weed growth and affect the aesthetic quality of the lake.

5. Nuisance (Toilet and Solid Waste) - a system causing faecal or urinary discharges to be exposed on the surface of the ground, either directly through a pipe or escaping from some part of a sewage disposal system. Also included in this classification is "solid waste" or garbage of a kind which can cause a "nuisance"; for example, domestic garbage containing food waste.

6. Direct Polluter - a system which is permitting sewage to contaminate the ground water or to reach the lake either by direct discharge through a pipe or ditch or over the ground surface.

Classification of Sewage Disposal Systems (Cont'd)

7. Unclassified (temporarily) - a system which has been given a preliminary classification by the student inspector where he feels he cannot use any of the preceeding classifications and has doubts about the system, or any part of it. These systems require further inspection by the supervisor who will attempt to make a final classification after a thorough investigation.

8. Unclassified - a system (or systems) where it is not possible by the end of the survey to make a classification. This category includes only a few abandoned premises in a dilapidated condition with a system that is obviously not in use and could not be used.

WATER SAMPLING

The Public Health Laboratories provided the necessary water sample analyses to detect total and faecal coliforms in the lake water samples.

Drinking water samples were obtained when the cottager was using an unchlorinated water supply. These samples were analysed at the Public Health Laboratory. Any owner having a drinking water sample which contained total or faecal coliforms was immediately informed to this effect. Instructions were sent regarding procedures for disinfecting the drinking water supply.

Most lake water samples fell well within the criteria for total body contact recreational use of 1,000 total coliforms per 100 ml, and 100 faecal coliforms per 100 ml, as outlined in the Ministry of the Environment booklet "Guidelines and Criteria for Water Quality Management, July, 1974."

CORRECTIVE PROCEDURE

After a file is examined by the supervisor and the original classification is confirmed or altered, it is referred to an Environmental Officer. The Officer then interviews the establishment owner to advise him of the findings and discuss corrective action. If the owner agrees with the findings, a corrective program is initiated. He is asked to sign a "Pollution Abatement Report" stating the problems found and corrections required to be completed by a specific date. A final inspection is carried out upon completion of the corrective work and the sewage disposal system file is appropriately reclassified. Occasionally an owner refuses to comply with a correction program and legal action must be initiated.

In the case of commercial establishments, this procedure is often more complicated, requiring an engineering study and the submission of plans and soil analysis reports for approval. Except where there is direct pollution, the owner is contacted and is instructed to submit plans for corrective measures to be completed prior to the opening of the next commercial season.

A direct polluter must take corrective action immediately to prevent any further deterioration of water quality in the lake.

METHODS OF SEWAGE DISPOSAL

Much of the shoreline property in Muskoka and Haliburton has minimal soil depth over bedrock. Therefore it is unsuitable, in a natural state, for sub-surface sewage disposal. This can be remedied in some areas by placing suitable filter material over an area capable of supporting a sub-surface sewage disposal system.

Methods of Sewage Disposal (Cont'd)

The use of a holding tank may provide a more economical solution for the disposal of sewage and may be recommended if a contract for the pump-out of the tank contents can be secured. (It should be noted that disposal sites for holding tank contents are rapidly nearing capacity. This may result in the restriction of the use of holding tanks.)

On some lots where there is restricted space for a conventional sewage disposal system, the installation of a proprietary aerobic sewage treatment system may provide a viable alternative.

Recently there have been many developments in sewage disposal systems and the Ministry of the Environment is continually monitoring new systems which are marketed in Ontario.

The Ministry of the Environment or other designated authority should be consulted and approval obtained before any sewage disposal system is installed.

ABATEMENT PROGRESS FROM 1977 COTTAGE POLLUTION CONTROL PROGRAM

During the summer of 1977 the Cottage Pollution Control Program was conducted on the following lakes: Honey Harbour, Milford Bay (Lake Muskoka) and Woodroffe Bay (Lake Joseph) in the District Municipality of Muskoka, and Paudash Lake in the Provisional County of Haliburton. A total of 1,534 private sewage disposal systems were inspected. Of these, 12% were performing satisfactorily, 42% were found to be seriously sub-standard, 35% were discharging wash water or solid waste onto the ground surface, 4% were direct polluters and 7% were unclassified after the initial detection survey. All of the owners with seriously sub-

standard systems were contacted and advised that their system should be watched carefully and may require updating in the near future. As of January 1st, 1979, corrective action on 258 of the systems which required upgrading was completed. The owners of the majority of the remaining systems requiring upgrading have signed agreements for completion during the summer of 1979.

Legal action will be initiated against the few remaining owners who have refused to respond to several attempts by Environmental Officers to have corrective action carried out.

1978 COTTAGE POLLUTION CONTROL PROGRAM

HONEY HARBOUR

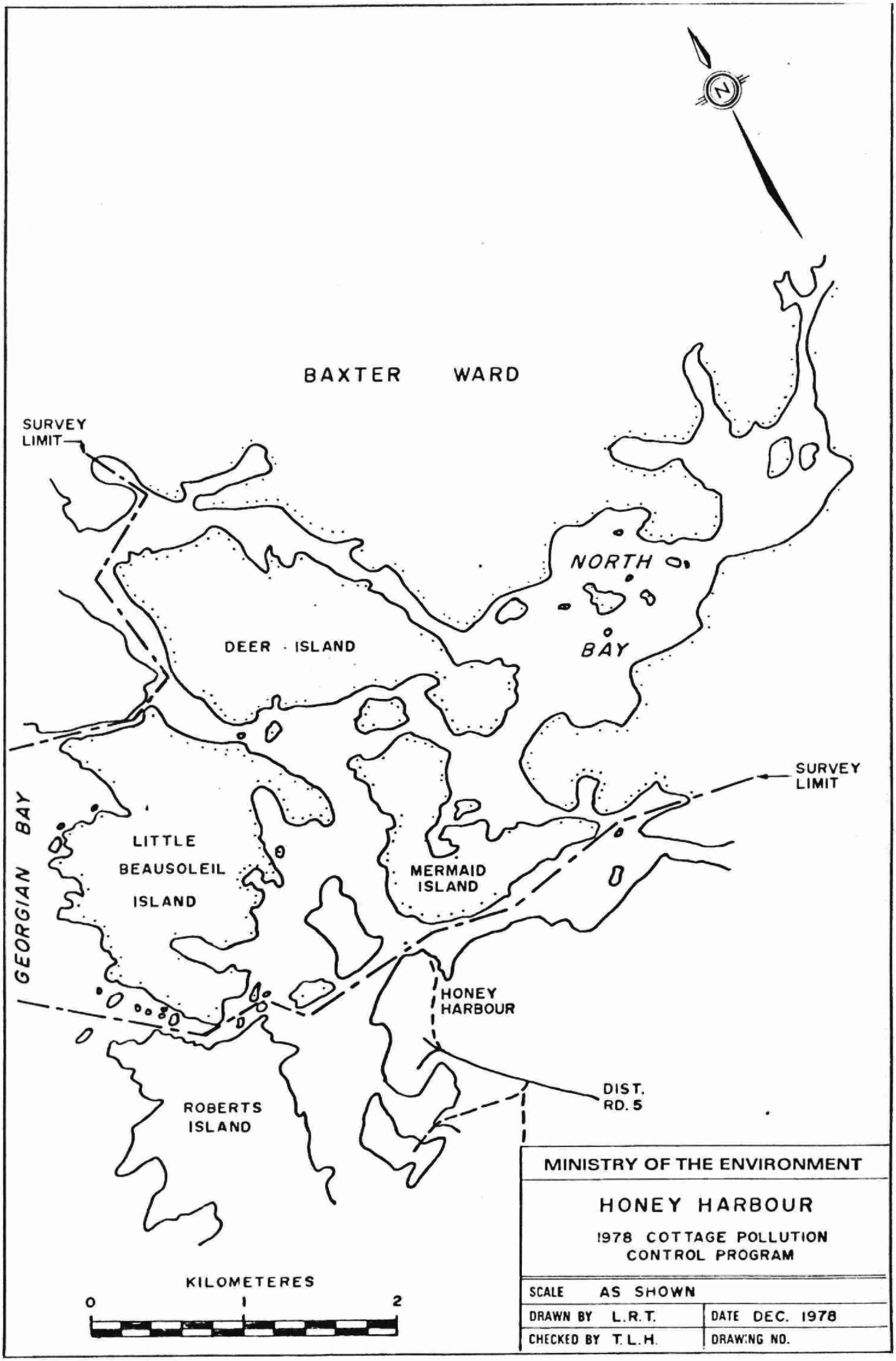
Honey Harbour is located on Georgian Bay, just north of the mouth of the Severn River. It is in Baxter Ward of the Township of Georgian Bay.

Honey Harbour lies on the Precambrian Shield at an elevation of 176 metres (576 feet) above sea level. The area was subjected to glacial scouring which left exposed rock or shallow till soils. The windswept shoreline results in shallow silty soils occasionally combined with sand or clay with numerous rock outcroppings.

The limits of the survey were the northwest part of South Bay as the southerly boundary, to the northern section of North Bay as the northerly boundary. This included all of North Bay, Mermaid Island, Deer Island and Little Beausoleil Island, together with many small islands.

Within these limits, 476 private sewage disposal systems were inspected. Of these systems, 151 or 32% were classified as seriously substandard, 174 or 37% were unsatisfactory due to improper disposal of solid waste or wash water, and 14 or 3% were classified as direct polluters. (See Appendix I for further classification information).

As of December 31st, 1978, 59 faulty systems have been corrected, and 58 owners have signed agreements to have work completed during the construction season of 1979. The remainder were notified by letter of their problems and corrective action required. Ministry Environmental Officers are currently directing their efforts toward obtaining commitments from these owners.



MINISTRY OF THE ENVIRONMENT

HONEY HARBOUR

1978 COTTAGE POLLUTION CONTROL PROGRAM

SCALE AS SHOWN	
DRAWN BY L.R.T.	DATE DEC. 1978
CHECKED BY T.L.H.	DRAWING NO.

SEVERN RIVER

The Severn River flows from Lake Couchiching to Sparrow Lake, then continues to Georgian Bay. The river for most of its route is the boundary between the District Municipality of Muskoka and Simcoe County. The exception is between Washago and the Cooper's Falls Road, where the river divides Orillia and Rama Townships of Simcoe County.

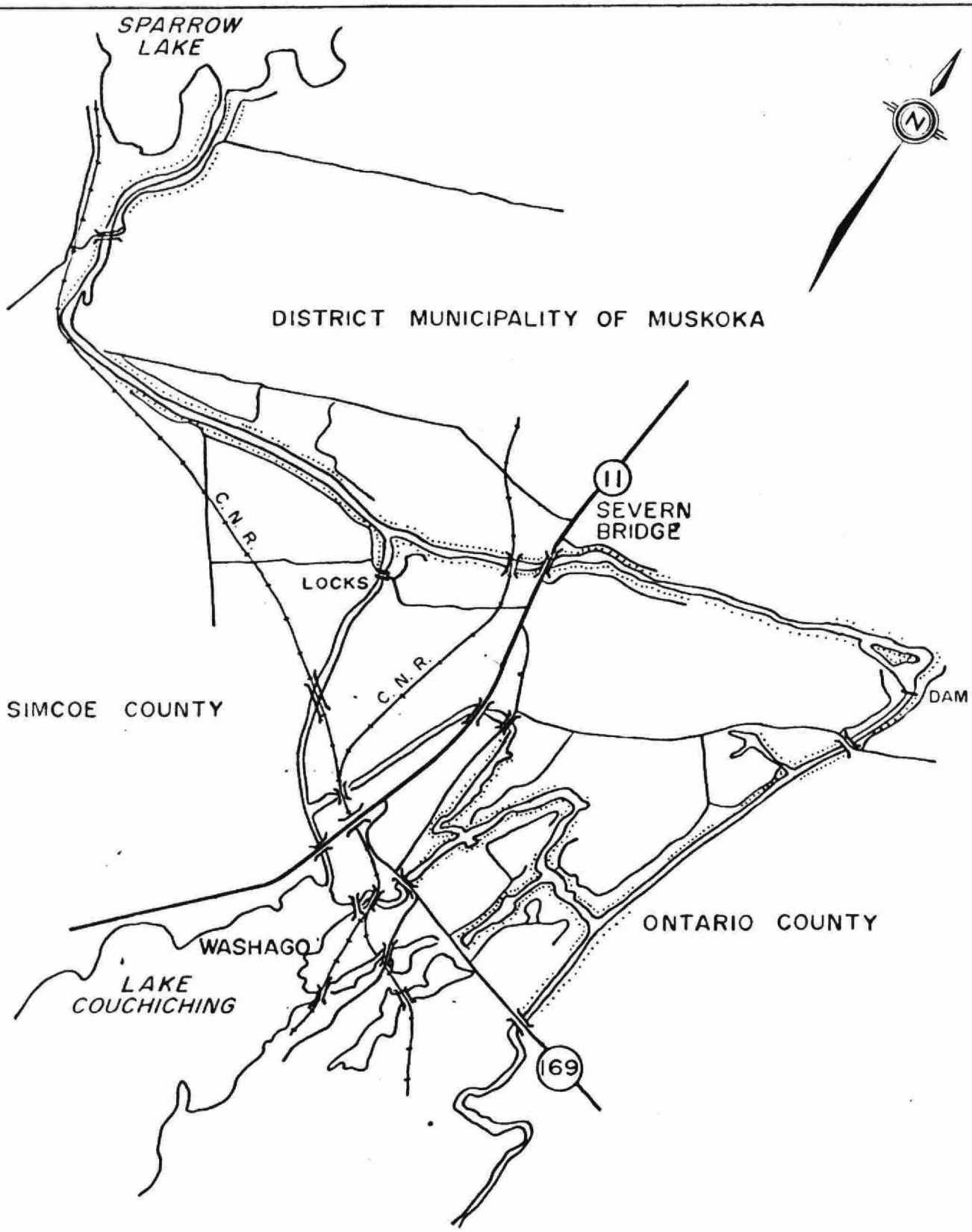
The Limits of the survey were from the north side of Highway 169 at Washago to the inlet of Sparrow Lake. This area includes three townships:- Morrison Township in the District Municipality of Muskoka, Orillia Township and Rama Township in Simcoe County.

Within these limits, 833 private sewage disposal systems were inspected during the summer of 1978. Of these systems, 610 were in Simcoe County, while 223 were in Muskoka. There were 227 or 27% classified as seriously substandard, 123 or 15% were unsatisfactory due to improper disposal of solid waste or washwater, and 6 or 1% were classified as direct polluters. (See Appendix I for further classification information.)

The natural split created by the River between Muskoka and Simcoe County has left two agencies responsible for ensuring problems are corrected. These agencies are the Simcoe County Health Unit in Simcoe County and the Ministry of the Environment in Muskoka.

As of December 31, 1978, 46 systems had been corrected in Muskoka and 11 have signed agreements to have work completed during the construction season of 1978. The remaining 13 were notified by letter of their problems and corrective action required. The Ministry Environmental Officers are currently directing their efforts toward obtaining commitments from these owners.

The Simcoe County Health Unit is actively pursuing corrections in Orillia and Rama Townships.



MINISTRY OF THE ENVIRONMENT

SEVERN RIVER

1978 COTTAGE POLLUTION CONTROL PROGRAM

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INDIAN RIVER

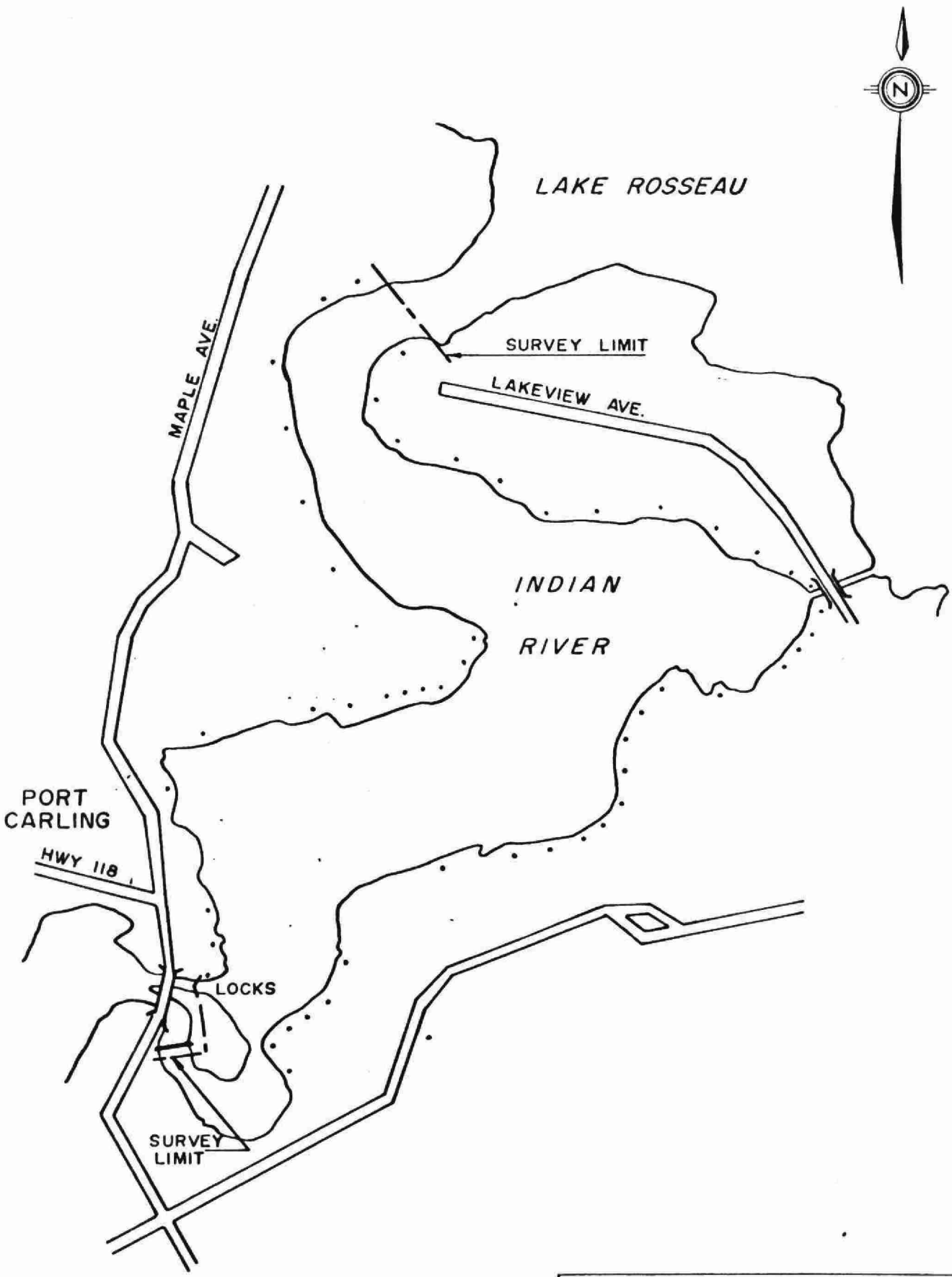
The Indian River flows from Lake Rosseau to Lake Muskoka. It is located in the District of Muskoka, Township of Muskoka Lakes, Medora Ward and flows through the Village of Port Carling.

The shoreline is rugged to gently sloping with a mixture of coniferous and deciduous trees. The soil generally consists of a shallow silty till with some clay and sandy-silt deposits.

The limits of the survey were from the locks at Port Carling as a southerly boundary, to the point of Lakeview Park Island as a northerly boundary. Both sides of the river were completed within these limits.

There were 67 private sewage disposal systems inspected on the Indian River during the summer of 1978. Of these, 14 or 21% were classified as seriously substandard, 13 or 19% were unsatisfactory due to improper disposal of solid waste or washwater and 14 or 21% were temporarily unclassified and on re-inspection, revealed some further problems. No systems were classified as direct polluters. (See Appendix I for classification information).

As of December 31, 1978, 38% of the faulty systems have been corrected and 50% of the remaining owners with problems have signed agreements to have work completed during the construction season of 1979. The remainder were notified by letter of their problems and corrective action required. The Ministry Environmental Officers are currently directing their efforts toward obtaining commitments from these owners.



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MINISTRY OF THE ENVIRONMENT		
INDIAN RIVER 1978 COTTAGE POLLUTION CONTROL PROGRAM		
SCALE	AS SHOWN	
DRAWN BY	L.R.T.	DATE DEC. 1978
CHECKED BY	T.L.H.	DRAWING NO.

APPENDIX I

PRELIMINARY CLASSIFICATION OF SYSTEMS INSPECTED

1978

BODY OF WATER	NUMBER OF SYSTEMS INSPECTED	CLASSIFICATION OF SYSTEMS *															
		SATISFACTORY		SATISFACTORY PERFORMANCE		SERIOUSLY SUBSTANDARD		NUISANCE (WASH WATER)		NUISANCE (SOLID WASTE)		DIRECT POLLUTER		UNCLASSIFIED TEMPORARILY		UNCLASSIFIED	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Honey Harbour	476	27	5.7	65	13.7	151	31.7	137	28.8	37	7.8	14	2.9	45	9.4		
Severn River	833	191	22.9	178	21.4	227	27.3	92	11.0	31	3.7	6	0.7	108	13.0		
Indian River	67	9	13.4	17	25.4	14	20.9	2	3.0	11	16.4	0	0	14	20.9		
	1,376	227	16.5	260	18.9	392	28.5	231	16.8	79	5.7	20	1.5	167	12.1		

* See page 4 for definition of classifications

LAKES SURVEYED - MUSKOKA-HALIBURTON

YEAR OF SURVEY	LAKE	NUMBER OF SYSTEMS INSPECTED
1967	Six Mile (Crooked Bay)	165
1969	Riley	150
1970	Sparrow	302
1971	Muskoka (Muskoka Bay)	270
1971	Leonard	112
1974	Bass (Ryde)	23
1974	Clear (Wood)	155
1974	Harp	78
1974	Kahshe	481
1974	Twelve Mile Bay	168
1974	Wood	205
1975	Muskoka (Bala Bay)	280
1975	Dark	38
1975	Gull (Muskoka)	138
1975	Gull (Haliburton)	413
1975	Silver	37
1975	Three Mile	542
1976	Joseph (Ames Point)	25
1976	Muskoka (Sandy Bay)	17
1976	Dickie	121
1976	Go Home Bay	119
1976	Loon	175
1976	Muldrew	378
1976	Ril	140
1976	Turtle	63
1977	Honey Harbour (South Bay)	834
1977	Muskoka (Milford Bay)	292
1977	Paudash (Haliburton)	364
1977	Joseph (Woodroffe Bay)	44
1978	Honey Harbour (North Bay)	476
1978	Severn River	833
1978	Indian River	67

ABOUT COTTAGE POLLUTION CONTROL

This material is designed to provide pollution control information to cottage owners in Ontario's recreational lakes districts. Of interest to cottagers is data on nutrient enrichment of lakes, septic tanks, water treatment, proper boat maintenance and mosquito and black fly control.

EUTROPHICATION OR EXCESSIVE FERTILIZATION AND LAKE PROCESSES

In recent years, cottagers have become aware of the problems associated with nutrient enrichment (eutrophication) of recreational lakes and have learned to recognize many of the symptoms characterizing nutrient enriched (eutrophic) lakes. It is important to realize that small to moderate amounts of aquatic plants and algae are necessary to maintain a balanced aquatic environment. They provide food and suitable environment for the growth of aquatic invertebrate organisms which serve as food for fish. Shade from large aquatic plants helps to keep the lower water cool, which is essential to certain species of fish and also provides protection for young game and forage fish. Numerous aquatic plants are utilized for food and/or protection by many species of waterfowl. Too much growth, however, creates an imbalance in the natural plant and animal community, particularly with respect to oxygen conditions. Some desirable forms of life such as sport fish are eliminated and unsightly algae scums can form. The lake will not be "dead" but rather abound with life which, unfortunately, is not considered aesthetically pleasing. This change to poor water quality becomes apparent after a period of years during which extra nutrients are added to the lake. Return to a natural state may also take a number of years after the nutrient inputs are stopped.

Changes in water quality with depth are a very important characteristic of the lake. Water temperatures are uniform throughout the lake in the early spring and winds generally keep the entire volume well mixed. Shallow lakes may remain well mixed all summer so that water quality will be the same throughout. On the other hand, in deep lakes, the surface waters warm up during late spring and early summer and float on the cooler more dense water below. The difference in density offers a resistance to mixing by wind action and many lakes do not become fully mixed again until the surface waters cool down in the fall. The bottom water receives no oxygen from the atmosphere during this unmixed period and the dissolved oxygen supply may be all used up by bacteria as they decompose organic matter. Cold water fish, such as trout, will have to move to the warm surface waters to get oxygen and because of the high water temperatures they will not thrive, so that the species will probably die out (see Figure A next page).

Low oxygen conditions in the bottom waters are not necessarily an indication of pollution. Excessive aquatic plant and algae growth and subsequent decomposition in the bottom waters can aggravate this conditions and in some cases result in zero oxygen levels in lakes which had previously held some oxygen in the bottom waters all summer. Although plant nutrients normally accumulate in the bottom waters of the lakes, they do so to a much greater extent if there is no oxygen present. These nutrients become available for algae in the surface waters when the lake mixes in the fall and dense algae growths can result.

Consequently, lakes which have no oxygen in the bottom water during the summer are more prone to having algae problems and are more vulnerable to nutrient inputs than lakes which retain some oxygen.

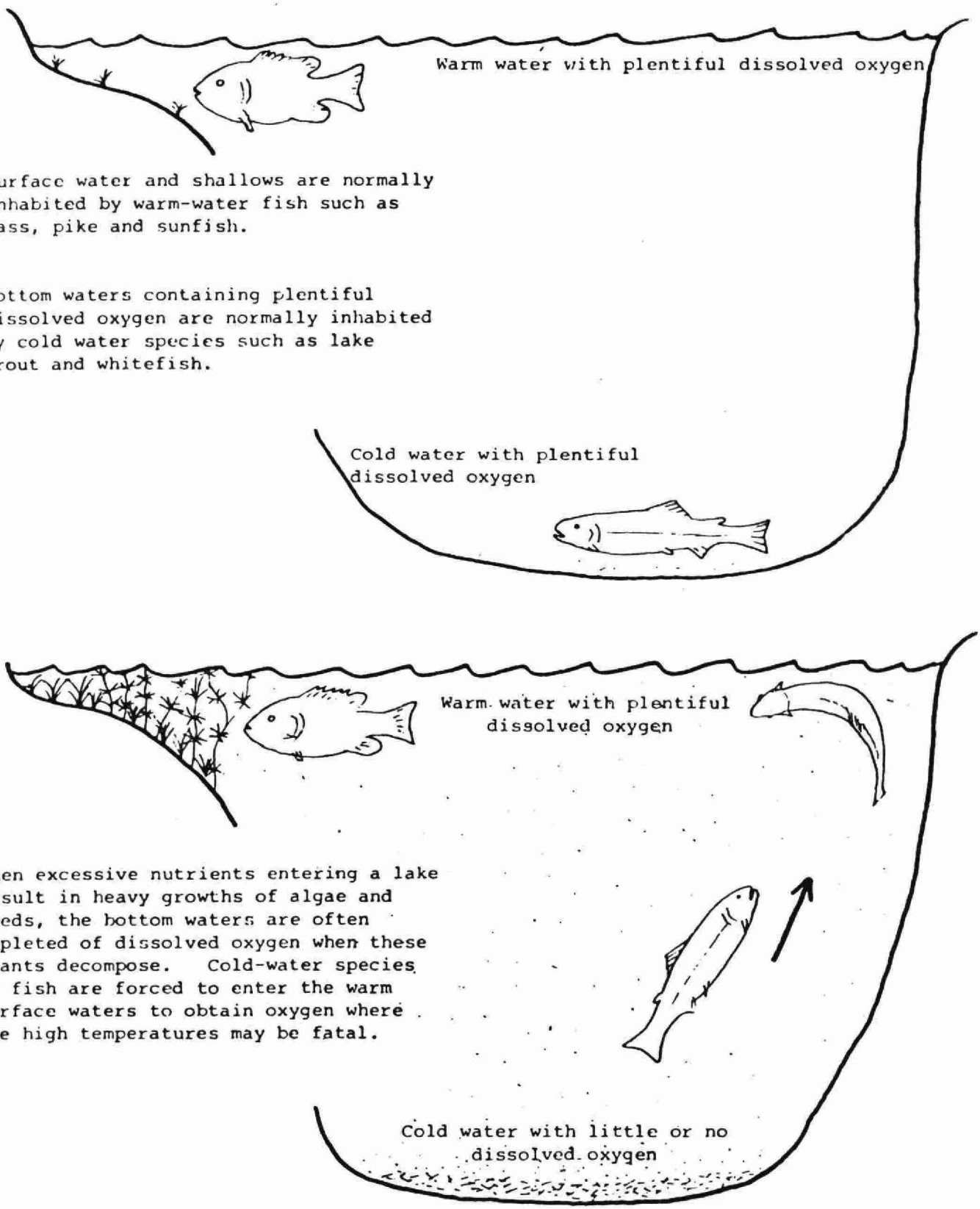

Figure A DECOMPOSITION OF PLANT MATTER AT THE LAKE BOTTOM CAN LEAD TO DEATH OF DEEP-WATER FISH SPECIES.

Like humans, aquatic plants and algae require a balanced "diet" for growth. Other special requirements, including those for light and temperature, are specific for certain algae and plants. Chemical elements such as nitrogen, phosphorous, carbon, and several others are required and must be in forms which are available for uptake by plants and algae. Growth of algae can be limited by a scarcity of any single "critical" nutrient. Nitrogen and phosphorous are usually considered "critical" nutrients because they are most often in scarce supply in natural waters, particularly in lakes in the Precambrian Shield area of the Province. Phosphorous, especially is necessary for the processes of photosynthesis and cell division. Nitrogen and phosphorous are generally required in the nitrate-N (or ammonia-N) and phosphate forms and are present in natural land runoff and precipitation. Human and livestock wastes are a very significant source of these and other nutrients for lakes in urban and agricultural areas. It is extremely important that cottage waste disposal systems function properly so that seepage of nutrients to the lake does not occur. Changes to water quality brought about by excessive inputs of nutrients to lakes are usually evidenced by excessive growths of algae and aquatic plants.

The large amounts of suspended algae which develop from excessive inputs of nutrients, result in water of poor clarity or transparency. On the other hand, lakes with only small, natural inputs of nutrients and correspondingly low nutrient concentrations (characteristically large and deep lakes) most often support very small amounts of suspended algae and, consequently, are clear-water lakes. An indication of the degree of enrichment of lakes can, therefore, be gained by measuring the density of suspended algae (as indicated by the chlorophyll a concentration - the green pigment in most plants and algae) and water clarity (measured with a Secchi disc). In this regard, staff of the Ministry of the Environment

have been collecting chlorophyll a and water clarity data from several lakes in Ontario and have developed a graphical relationship between these parameters. This is being used by cottagers to further their understanding of the processes and consequences of nutrient enrichment of Precambrian lakes. The figure shown on the following page illustrates the above-mentioned relationship.

In the absence of excessive coloured matter (e.g. drainage from marshlands), lakes which are very low in nutrients are generally characterized by small amounts of suspended algae (i.e. chlorophyll a) and are clear-water lakes with high Secchi disc values. Such lakes, with chlorophyll a and Secchi disc values lying in the upper left-hand area of the graph are unenriched or nutrient poor ("oligotrophic") in status and do not suffer from the problems associated with excessive inputs of nutrients. In contrast, lakes with high chlorophyll a concentrations and poor clarity are positioned in the lower right-hand area of the graph and are enriched ("eutrophic"). These lakes usually exhibit symptoms of excessive nutrient enrichment including water turbidity owing to large amounts of suspended algae which may float to the surface and accumulate in sheltered areas around docks and bays.

Measurements of suspended algal density (chlorophyll a) and water clarity are especially valuable if carried out over several years. Year to year positional changes on the graph can then be assessed to determine whether or not changes in lake water quality are developing, so that remedial measures can be implemented before conditions become critical.

MEAN CHLOROPHYLL a AND SECCHI DISC MEASUREMENTS

Self-Help Program - 1978

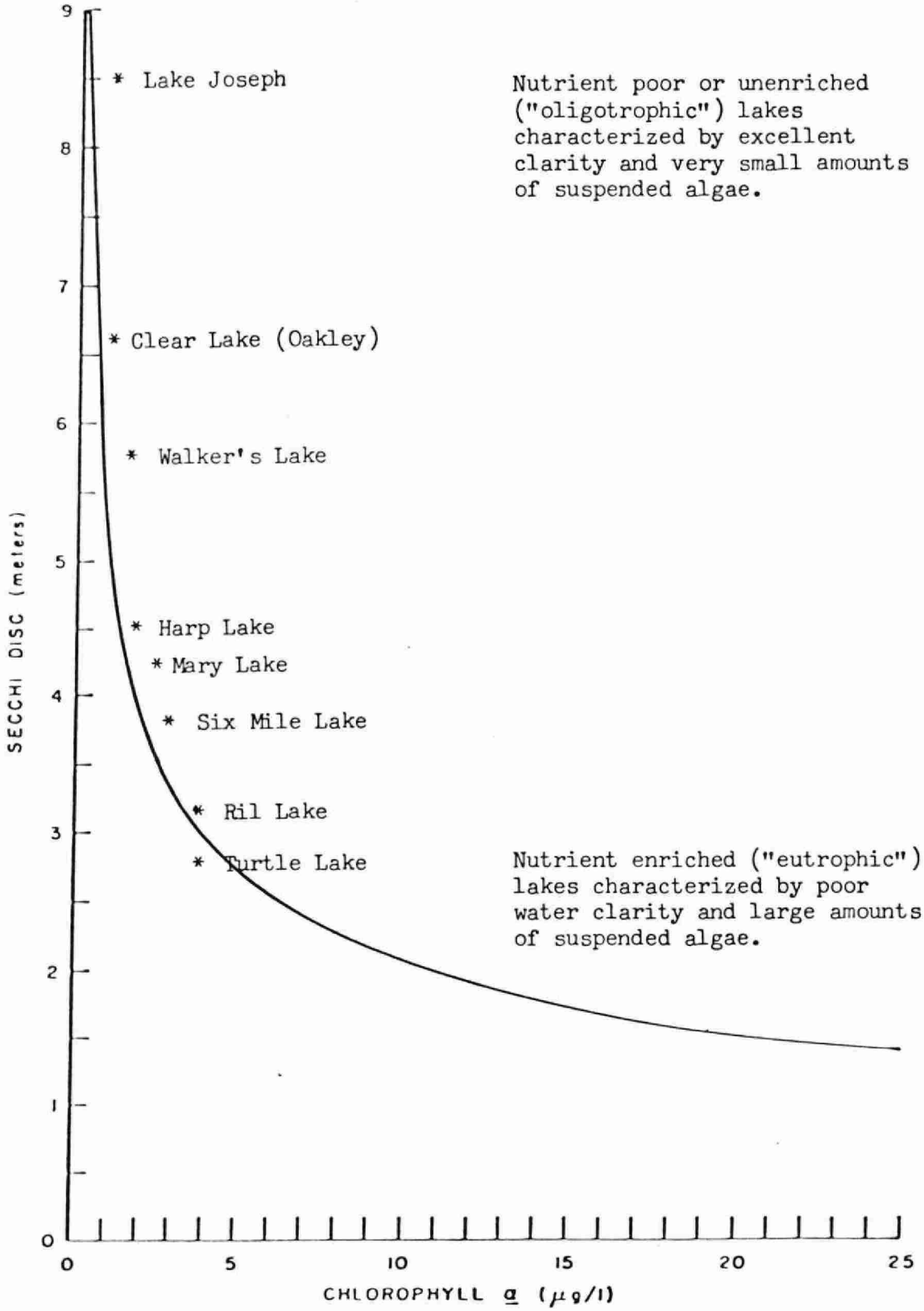

Figure B

SECCHI DISC-CHLOROPHYLL a SELF-HELP PROGRAM

The "Self-Help Program" was initiated in 1971 in response to requests for water quality surveys from concerned cottagers on many recreational lakes throughout the Province. Previous experience indicated that the enrichment status of a lake can be estimated relatively easily by using Secchi disc readings and chlorophyll a concentrations (the green pigment in algae) to give an indication of water clarity and algal density respectively.

Cottage Associations are supplied with sampling kits which include a Secchi disc, a water sampler, bottles and instructions. Participants are asked to take Secchi readings and to collect water samples bi-weekly during the ice-free period of the year. The water samples are shipped to the nearest Ministry of the Environment laboratory where they are analyzed for chlorophyll a. The true value of the program is only realized if it is continued for a number of years in order to delineate long term trends.

Mean annual Secchi disc readings and chlorophyll a concentrations in uncoloured lakes have been grouped into approximate ranges to indicate the status of enrichment.

SECCHI DISC (S.D.) (metres - m)		CHLOROPHYLL a (Chloro-a) (micrograms per litre-ug/l)	
Enriched	0-3 m	High Algal Density	4 ug/l or greater
Moderately Enriched	3-5 m	Moderate Algal Density	2-4 ug/l
Unenriched	5 m or greater	Low Algal Density	0-2 ug/l

It is important to note that this program is not applicable to rivers or large bodies of open water.

ACIDIC PRECIPITATION IN CENTRAL REGION

In a 1977 report, the Ministry of the Environment identified the occurrence of acidic precipitation in south-central Ontario. Rain and snowfall in this area is 30 to 40 times more acidic than "normal" precipitation and is of particular concern in such areas as Parry Sound, Muskoka and Haliburton since the geological terrain has a very limited capacity for assimilating the acids.

Since then, preliminary consideration has been given to the effects of acidic precipitation on lakes in this region. An initial survey of twenty-six lakes was conducted to assess the magnitude of the problem and showed that approximately 20% were in a critical state of sensitivity to further additions of acid. Further surveys are currently being carried out. In addition, consideration has been given to the effect of the sudden acidic input to lakes which occurs during spring snow-melt.

Current and future studies on the effects of acidic precipitation will be co-ordinated within the framework of an expected major provincial study program.

AQUATIC PLANT CONTROL

Many shallow lakes, such as those in the Kawartha District, provide ideal conditions for aquatic plants. These lakes are warm in summer and the profuse plant life provides an excellent habitat for sport fish species. Unfortunately, the plants pose a problem when man attempts to use the lakes for recreation. These lakes may be quite healthy, but the plants are only a "problem" when man wants to make specific use of the water.

Complete removal of the plant life is not desirable since it is important for good fishing. Some management technique is needed that will satisfy the needs of boaters, fishermen, and swimmers, but that also will maintain the lake's healthy state.

PLANT HARVESTING

Mechanical harvesting has shown to be applicable to the Kawartha situation. Ministry of the Environment experiments in Chemung Lake in 1976 covered more than 1,000 acres of the lake. The fish were there, but the fishermen could not get to them because of the heavy plant growth.

Plant harvesting is a good example of a technique which satisfies man's requirements and still protects or even improves the natural lake conditions.

SEPTIC TANK INSTALLATIONS

In Ontario, provincial law requires under Part 7 of The Environmental Protection Act that before you extend, alter, enlarge, or establish any building where a sewage system will be used, a Certificate of Approval must be obtained from the Ministry of the Environment or its representatives. The local municipality or Health Unit may be delegated the authority to

issue the Certificate of Approval. Any other pertinent information such as size, types, and location of septic tanks and tile fields can also be obtained from the same authority.

(1) General Guidelines

A septic tank should not be closer than:

- 50 feet to any well, lake, stream, pond, spring, river or reservoir
- 5 feet to any building
- 10 feet to any property boundary

The tile field should not be closer than:

- 100 feet to the nearest dug well
- 50 feet to a drilled well which has a casing to 25 feet below ground
- 25 feet to a building with a basement that has a floor below the level of the tile in the tile bed
- 10 feet to any other building
- 10 feet to a property boundary
- 50 feet to any lake, stream, pond, spring, river or reservoir.

The ideal location for a tile field is well-drained, sandy loam soil remote from any wells, or other drinking water sources. For the tile field to work satisfactorily, there should be at least three feet of soil between the bottom of the weeping tile trenches and the top of the ground water table or bedrock.

Recognizing that private sewage systems are relatively inefficient where shallow and inappropriate soil conditions are present (e.g. Precambrian areas) the Ministry of the Environment is conducting research into alternate methods of private sewage disposal in unsewered areas. Improvement to existing equipment and methods of design and operation are being investigated.

Also, better surveillance methods such as the use of chemical, biological, and radioactive tracers to detect the movement of pollutants through the soil mantle are being developed.

DYE TESTING OF SEPTIC TANK SYSTEMS

There is considerable interest among cottage owners to dye test their sewage systems; however, several problems are associated with dye testing. Dye would be visible to the eye from a system that has a fairly direct connection to the lake. Thus, if a cottager dye-tested his system and no dye was visible in the lake, he might assume that his system is satisfactory. This may not be the case. A low concentration of dye is not visible and, therefore, expensive equipment such as a fluorometer is required for detection. Only qualified people with adequate equipment are capable of assessing a sewage system by the use of dye. In any case, it is likely that some of the water from a septic tank will eventually reach the lake. The important question is whether all contaminants including nutrients have been removed before it reaches the lake. To answer this question special knowledge of the system, soil depth and composition, underground geology of the region, and the shape and flow of the shifting water table are required. Therefore, it is recommended that this type of study should be performed only by qualified professionals.

MICROBIOLOGY OF WATER

For the sake of simplicity, the micro-organisms in water can be divided into two groups: the bacteria that thrive in the lake environment and make up the natural bacterial flora; and the disease-causing micro-organisms, called pathogens, that have acquired the capacity to infect human tissues.

The "pathogens" are generally introduced to the aquatic environment by raw or inadequately treated sewage, although a few are found naturally in the soil. The presence of these bacteria does not change the appearance of the water but poses an immediate public health hazard if the water is used for drinking or swimming. The health hazard does not necessarily mean that the water user will contract serious water borne infections such as typhoid fever, polio, or hepatitis, but he may catch less serious infections of gastroenteritis (sometimes called stomach flu), dysentery, or diarrhea. Included in these minor afflictions are eye, ear, and throat infections and the more insidious but seldom diagnosed, subclinical infections leave a person not feeling well enough to enjoy holidaying although not necessarily bedridden. This type of microbial pollution can be remedied by preventing wastes from reaching the lake. Water quality will then return to a satisfactory level within a relatively short time (approximately one year) since disease-causing bacteria usually do not thrive in an aquatic environment.

The rest of the bacteria live and thrive within the lake environment. These organisms are the instruments of biodegradation. Any organic matter in the lake will be used as food by these organisms and will give rise, in turn, to subsequent increases in their numbers. Natural organic matter as well as that from sewage, kitchen wastes, oil and gasoline are readily attacked by these lake bacteria. Unfortunately, biodegradation of the organic wastes by organisms uses correspondingly large amounts of the dissolved oxygen. If the organic matter content of the lake gets high enough, these bacteria will deplete the dissolved oxygen supply in the bottom waters and threaten the survival of many deep-water fish species.

RAINFALL AND BACTERIA

The "Rainfall Effect" relates to a phenomenon that has been documented in previous surveys of the Recreational Lakes. Heavy precipitation has been shown to flush the land area around the lake. Subsequent runoff will carry available contaminants including sewage organisms as well as natural soil bacteria with it into the water.

Total coliforms, faecal coliforms, and faecal streptococci, as well as other bacteria and viruses which inhabit human waste disposal systems, can be washed into the lake. In Precambrian areas where there is inadequate soil cover and in fractured limestone areas where fissures in the rocks provide access to the lake, this phenomenon is particularly evident.

Melting snow provides the same transportation function for bacteria, especially in an agricultural area where manure spreading is carried out in the winter on top of the snow.

Previous data from sampling points situated 50 to 100 feet from shore indicate that contamination from shore generally shows up in the water body within 12 to 48 hours after a heavy rainfall.

WATER TREATMENT

Lake and river water is open to contamination by man, animals, and birds (all of which can be carriers of disease); consequently, NO SURFACE WATER MAY BE CONSIDERED SAFE FOR HUMAN CONSUMPTION without prior treatment, including disinfection. Disinfection is especially critical if coliforms have been shown to be present.

Disinfection can be achieved by:

(a) Boiling

Boil the water for a minimum of five minutes to destroy the disease-causing organisms.

(b) Chlorination

Chlorination using a household bleach containing 4 to $5\frac{1}{4}$ per cent available chlorine.

Eight drops of household bleach solution should be mixed with one gallon of water and allowed to stand for 15 minutes before drinking.

(c) Continuous Chlorination

For continuous water disinfection, a small domestic hypo-chlorinator (sometimes coupled with activated charcoal filters) can be obtained from a local plumber or water equipment supplier.

(d) Well Water Treatment

Well water can be disinfected using a household bleach (assuming strength at five per cent available chlorine) if the depth of water and diameter of the well are known.

BOATING AND MARINA REGULATIONS

In order to help protect the lakes and rivers of Ontario from pollution, it is required by law that sewage (including garbage) from all pleasure craft, including houseboats, must be retained in suitable equipment.

Equipment which is considered suitable by the Ministry of the Environment includes: (1) retention devices with or without re-circulation which retain all toilet wastes for disposal ashore, and (2) incinerating devices which reduce all sewage to ash.

Equipment for storage of toilet wastes shall:

1. be non-portable
2. be constructed of structurally-sound material
3. have adequate capacity for expected use
4. be properly installed, and
5. be equipped with the necessary pipes and fittings conveniently located for pump-out by shore-based facilities (although not specified, a pump-out deck fitting with $1\frac{1}{2}$ inch diameter National Pipe Thread is commonly used).

An Ontario regulation requires that marinas and yacht clubs provide or arrange pump-out service for the customers and members who have toilet-equipped boats. In addition, all marinas and yacht clubs must provide litter containers that can be conveniently used by occupants of pleasure boats.

The following "tips" may be of assistance to you in boating:

1. Motors should be in good mechanical condition and properly tuned.
2. When a tank for outboard motor testing is used, the contents should not be emptied into the water.
3. If the bilge is cleaned, the waste material must not be dumped into the water.
4. Fuel tanks must not be overfilled and space must be left for expansion if the fuel warms up.
5. Vent pipes should not be obstructed and fuel needs to be dispensed at a correct rate to prevent blow-back.

6. Empty oil cans must be deposited in a leak-proof receptacle.

7. Slow down and save fuel.

BLACKFLIES AND MOSQUITOES

These are the most bothersome, biting insects in the cottage country. Mosquitoes breed in any kind of standing water whether a roadside ditch, unemptied pails of rainwater, flat roofs, or swampy areas. The simplest method for controlling mosquito larvae is making sure that any kind of receptacle around the cottage is kept free of water. The property should be laid out so that water standing in ditches is kept running, by careful drainage planning. Swimming pools should be properly filtered and chlorinated, and eavestroughs should be kept clear of leaves. Low depressed areas that might fill with water should be filled in. In the garden and lawns areas, regular mowing of weeds and grass, trimming hedges and removing unnecessary shrubbery will help remove wind and sun protection from adult mosquitoes. To minimize bites, make sure any holes in screeening are repaired, and make sure the screens are tightly sealed. Restrict outdoor activities in the evenings if at all possible, and keep the damper on your fireplace closed.

Lighter coloured clothing is less attractive to a hungry mosquito and if you are working or visiting in areas where the mosquito population is heavy, make sure to wear loose protective clothing such as long sleeved shirt, light jacket, slacks, and socks. Mosquitoes are particularly bothersome at night and in dark wooded areas during the day, so take the proper precautions and you will suffer less.

Repellents are available in both liquid or stick form. Read the instructions carefully before using and be careful not to get the material in your

eyes or mouth. The types that contain a higher concentration (in percentage) of the active ingredient will do a better job.

Blackflies are particularly bothersome in the early weeks of summer. They breed in fast-flowing watercourses so the best method of fighting them is by larviciding over a large area. This kind of project is best managed by a community or provincial government agency. Fogging or pesticidal spraying over a large area will have temporary benefits but the practice does not justify the hazard of contaminating nearby water bodies. Complete eradication of biting fly populations can never be realized, and real control is not possible because of the limitation of funds and a lack of sufficient trained personnel. Individual landowners may operate their own larviciding in small areas (swamps, standing water, and rain pools adjacent to cottages) but it should be remembered that permits are required where the program might affect adjacent streams or lakes. The permit must be obtained from the Pesticides Control Section, Ministry of the Environment, 12 Fairview Road, Box 937, Barrie, Ontario, L4N 4P3.